SURFACE SHAPING OF DEVICE PACKAGES TO MITIGATE FRACTURES UNDER BENDING STRESS

FIELD

[0001] The described embodiments relate generally to mechanisms for reducing fractures of device components. More particularly, the present embodiments relate to structures that can be incorporated onto device components to counteract forces of impact against a computing device in which the device components are incorporated.

BACKGROUND

[0002] Computing devices have become thinner and more compact as a result of many advances in technology. However, because thinner devices can be susceptible to bending, the components within the device often times become fractured as a result of high internal bending stresses caused by some external force impacting the device. These high in-plane stresses due to bending can be more critical than out-of-plane stresses resulting from impact. Although some devices may incorporate thicker housings or frames as solutions to counter bending and impact stresses, such solutions can necessitate additional materials that may reduce thermal efficiency of a device, increase cost of manufacturing the device, and limit the available space for internal components.

SUMMARY

[0003] This paper describes various embodiments that relate to features of a computing device for reducing damage to internal components caused by bending stresses. In some embodiments, a computing device is set forth as having a circuit board and a component connected to the circuit board. The component can include a curved spacer disposed over a surface of the component to mitigate bending stresses at the component. Furthermore, the computing device can include a cover glass and a display assembly that are configured such that the surface of the component faces the display assembly and the cover glass.

[0004] In other embodiments, a circuit component is set forth. The circuit component can include processing circuitry and a surface that at least partially covers the processing circuitry. Additionally, the circuit component can include a spacer disposed over the surface of the circuit component to mitigate bending stresses from damaging the processing circuitry. The spacer can have a curved profile and span a width of the surface of the circuit component.

[0005] In yet other embodiments, a system is set forth. The system can include a first circuit assembly comprising a first surface connected to a first component, a second component, and a bracket surrounding the first component. The system can further include a second circuit assembly comprising a second surface connected to a spacer disposed between the second component and the second surface. The spacer can be arranged to contact the second component when the second surface is bent toward the first surface.

[0006] Other aspects and advantages of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the described embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The disclosure will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements.

[0008] FIGS. **1**A-**1**C illustrate various views of a computing device according to some embodiments.

[0009] FIGS. **2**A-**2**C illustrate various views of spacers that can be incorporated into a computing device.

[0010] FIGS. **3**A-**3**C illustrate various views of a spacer that can be incorporated over a component of a computing device.

[0011] FIGS. **4**A-**4**C illustrate various views of a flat spacer that can be incorporated onto a component or surface of a computing device.

[0012] FIGS. **5**A-**5**C illustrate various views of a spacers that can be incorporated into a computing device.

[0013] FIGS. **6**A-**6**C illustrate various views of brackets that can be incorporate into a computing device.

[0014] FIG. **7** illustrates a method for forming and connecting a spacer to a computing device.

[0015] FIG. **8** illustrates a method for forming and connecting a bracket to a computing device.

DETAILED DESCRIPTION

[0016] In the following detailed description, references are made to the accompanying drawings, which form a part of the description and in which are shown, by way of illustration, specific embodiments in accordance with the described embodiments. Although these embodiments are described in sufficient detail to enable one skilled in the art to practice the described embodiments, it is understood that these examples are not limiting; such that other embodiments may be used, and changes may be made without departing from the spirit and scope of the described embodiments.

[0017] The embodiments disclosed herein related to systems, methods, and apparatuses for reducing impact stresses to certain device components when a device that incorporates the components receives some force from an impact against the device. The device can include a display, a housing, and one or more components connected to a circuit board between the display and the housing. The components can be connected on opposite sides of the circuit board and can include electrical components such as, but not limited to, a central processing unit (CPU), a graphics processing unit (GPU), a system on a chip (SOC), a power management unit (PMU), or any other component suitable for connecting to a circuit board. Because of the limited space within the device, when a force from an impact is received at the display or housing, the display or housing may bend into the circuit board, which can cause the components to also bend. Additionally, the impact can cause the components to be momentarily compressed, which can result in fractures on the components. In order to counteract the bends and stresses that can result from certain forces of impact, stress absorbing mechanisms can be incorporated onto the components and/or the logic board, as discussed herein.

[0018] These and other embodiments are discussed below with reference to FIGS. **1**A-**8**; however, those skilled in the art will readily appreciate that the detailed description given herein with respect to these figures is for explanatory purposes only and should not be construed as limiting.